AMENDMENT NO. 2 JUNE 2021

TO

IS 7285 (PART 1) : 2018 REFILLABLE SEAMLESS STEEL GAS CYLINDERS — SPECIFICATION

PART 1 NORMALIZED STEEL CYLINDERS

(Fourth Revision)

(*Second cover page, foreword*, *para* 2, *last sentence*) — Substitute the following for the existing:

'However, considering the prevailing practices of cylinder manufacturing in the country, changes have been made, wherever necessary.'

(*Second cover page, foreword*, *para* 4, *last sentence*) — Delete.

(*Second cover page, foreword*, *para* 5, *line* 3) — Substitute 'IS 8451 : 2009 Periodic inspection and testing of seamless steel gas cylinders — Code of practice' *for* 'IS 8541 : 2009 Periodic inspection and testing of high pressure gas cylinders — Code of practice.'

(*Page* 1, *clause* **3.1**, *title*) — Substitute 'Yield Strength (R_{eg})' *for* 'Yield Stress (R_e)' and wherever it appears in the standard.

(*Page* 2, *clause* **3.3**) — Substitute the following for the existing:

'**3.3 Tempering** — Toughening heat treatment which follows normalizing, in which the cylinder is heated to a uniform temperature below the lower critical point, Ac_1, of the steel.'

(*Page* 2, *clause* **3.4**) — Substitute the following for the existing:

'**3.4 Batch** — A quantity of up to 200 cylinders plus cylinder for destructive testing, of the same nominal diameter, thickness and design, made successively from the same heat number of steel and subjected to the same heat treatment for the same duration of time.'

(*Page* 2, *clause* **4**, *symbol* P_b) — Substitute the following for the existing:

'P_b = measured burst pressure, in bar, above atmospheric pressure;'

(*Page* 2, *clause* **4**, *symbol* R_g) — Substitute 'R_{mg}' *for* 'R_g' and wherever it appears in the standard.

(*Page* 2, *clause* **4**, *symbol* R_m) — Substitute 'R_{ma}' *for* 'R_m' and wherever it appears in the standard.

(*Page* 2, *clause* **5.1.1**, *Note* 2) — Substitute the following for the existing:

'**2** When steel is aluminium and silicon killed, nitrogen content shall be limited to 0.01 percent.'

(*Page* 3, *clause* **5.1.3**) — Substitute the following for the existing:

'**5.1.3** Grades of steel used for cylinder manufacture shall be compatible with the intended gas service, for example corrosive gases, embrittling gases (*see* IS/ISO 11114-1 and IS/ISO 11114-4).'

(*Page* 3, *clause* **5.1.3**) — Insert the following new clause:

'**5.1.4** Wherever continuously cast billet material is used, the manufacturer shall ensure that there are no deleterious imperfections (porosity) in the material to be used for making cylinders. Test shall be carried out as per **9.2.5** for confirmation.'

(*Page* 3, *clause* **5.2**) — Substitute the following for the existing:

'5.2 Controls on Chemical Composition

5.2.1 The steel used in the manufacture of gas cylinder shall be as per chemical composition specified in Table 1, unless otherwise permitted by the statutory authority.

The actual content of any element deliberately added shall be reported and their maximum content shall be representative of good steel making practice.

Table 1 Chemical Composition of Steel (Cast Analyses)

(*Clauses* 5.2.1 *and* 5.4)

Sl No. (1)	Element (2)	Contents in Percentage (Mass Fraction) (3)
i)	Carbon	0.45, *Max*
ii)	Manganese	1.20 – 1.70
iii)	Silicon	0.10 – 0.35
iv)	Chromium	0.20, *Max*
v)	Nickel	0.20, *Max*
vi)	Copper	0.20, *Max*
vii)	Combined value of micro alloying elements: that is, V, Nb, Ti, B, Zr, Sn	0.15, *Max*
viii)	Sulphur	0.015, *Max*
ix)	Phosphorus	0.020, *Max*
x)	Sulphur + Phosphorus	0.030, *Max*
xi)	Molybdenum	0.20 *Max*

NOTE — Actual cast analysis shall comply with **5.2.3**.

5.2.2 Other steels specified in IS 7285 (Part 2) for quenched and tempered cylinders may be used and subjected to normalizing and tempering as specified in **5.3** provided that they additionally pass the impact test requirements given in IS 7285 (Part 2) and the maximum actual tensile strength, R_{ma}, does not exceed 950 MPa.

5.2.3 The carbon, manganese silicon and molybdenum contents shall be given, with tolerances, such that the differences between the maximum and the minimum values of the cast do not exceed the values shown in col 5 of Table 2.

5.2.4 The cylinder manufacturer shall obtain and provide certificates of cast (heat) analysis of the steels supplied for the construction of gas cylinders. If check analysis is required, they shall be carried out either on specimen taken during manufacture from the material in the form as supplied by the steel maker to the cylinder manufacturer, or from finished cylinders. In any check analysis, the maximum permissible deviation from the values obtained for the cast analysis of that particular heat/cast, shall conform to the values specified in col 4 of Table 2.

Table 2 Chemical Composition Tolerances

(*Clauses* 5.2.3 *and* 5.2.4)

Sl No.	Element	Maximum Content in Percentage (Mass Fraction)	Maximum Permissible Deviation in Percentage (Mass Fraction)	Maximum Permissible Range in Percentage (Mass Fraction)
(1)	(2)	(3)	(4)	(5)
i)	Carbon	< 0.30 ≥ 0.30	0.06 0.07	0.06 0.07
ii)	Manganese	All values	0.30	0.30
iii)	Silicon	All values	0.30	0.30
iv)	Molybdenum	All values	0.15	0.15

5.2.5 Suitable steels other than above may be used with the prior permission of the statutory authority. In such a case, the yield and tensile strength of the steel taken for the purpose of calculating the wall thickness of the cylinder shall not be greater than the minimum values specified by the steel manufacturer.’

(*Page* 4, *clause* **6.1**) — Substitute the following for the existing:

‘6.1 General Requirements

6.1.1 The calculation of the wall thickness of the pressure containing parts shall be related to the guaranteed minimum yield strength (R_{eg}) of the material in the finished cylinder.

6.1.2 Cylinders may be designed with one or two openings along the central cylinder axis only.

6.1.3 For calculation purposes, the value of R_{eg} shall not exceed 0.75 R_{mg}.

6.1.4 The internal pressure upon which the calculation of wall thickness is based shall be the hydraulic test pressure (P_h).’

(*Page* 4, *clause* **6.2.3**, *second sentence*) — Substitute ‘The minimum guaranteed value of tensile strength in MPa (R_{mg}) shall be less than or equal to $R_{m\ Max}$ minus 100 MPa.’ *for* ‘The minimum guaranteed value of tensile strength in MPa (R_g) shall be less than or equal to $R_{m\ max}$ minus 120 MPa.’

[*Page* 4, *clause* **6.3.1** (*see also Amendment No*. 1)] — Substitute the following for the existing:

'**6.3.1** The guaranteed minimum wall thickness of the cylindrical shell of the cylinder to be calculated using Equations (1) and (2), and additionally condition (3) shall be satisfied.

$$a = \frac{D_\mathrm{o}}{2} \times \left(1 - \sqrt{\frac{10F \times R_\mathrm{eg} - \sqrt{3}P_\mathrm{h}}{10F \times R_{eg}}} \right) \qquad \ldots (1)$$

where the value of F is the lesser of 0.65 / ($R_\mathrm{eg}/R_\mathrm{mg}$) or 0.85 and F is design stress factor (variable)

The wall thickness shall also satisfy equation (2)

$$a \geq D_\mathrm{o} / 250 + 1 \qquad \ldots (2)$$

with an absolute minimum of a = 1.5 mm

The burst ratio shall be satisfied by test as given in equation (3)

$$P_\mathrm{b} / P_\mathrm{h} \geq 1.6 \qquad \ldots (3)$$

NOTES

1 It is generally assumed that P_h = 1.5 times working pressure for compressed gases for cylinders designed and manufactured to conform to this standard.

2 R_eg and R_mg shall be in MPa, Diameter in mm and P_h in bar.'

(*Page* 4, *clause* **6.3.2**) — Delete.

(*Page* 5, *clause* **6.5**, *Equation* 3) — Substitute '$h \geq 0.12\, D_\mathrm{o}$' *for* '$h \geq 0.10\, D_\mathrm{o}$'.

(*Page* 6, *clause* **6.6.3**, *second sentence*) — Substitute the following for existing:

'The threads shall be full form, clean cut, even, without chatter, answering to gauges, and concentric with axis of the cylinder.'

(*Page* 6, *clause* **6.6.3**, *Note*) — Delete.

(*Page* 6, *clause* **6.8.1**) — Insert the following sentence at the end:

'For non-toxic gas the cap may be replaced by guard.'

(*Page* 6*, clause* **6.8.1**) — Insert the following new clause:

‘**6.8.1.1** Cylinders assembled in cascades or skids, the neck rings may not be provided, as the valves are protected by the cascade frame itself during transportation.’

(*Page* 6*, clause* **6.9**) — Substitute the following for existing:

‘6.9 Design Drawing

A fully dimensioned drawing shall be prepared which includes the specification of the material (cast analyses), neck threads, working pressure, test pressure, mechanical properties selected for calculating the wall thickness, heat treatment parameters, hardness range, length, weight and water capacity.’

[*Page* 6*, clause* **7.1** e)] — Substitute the following for existing:

‘e) metal shall not be added in the process of closure of the end. Plugging to correct manufacturing defects in cylinder bases is not permitted.’

[*Page* 9*, clause* **9.2.3.3** a), *para* 2] — Substitute the following for the existing:

‘For the result of a bursting test to be considered satisfactory, the following requirements shall be met:

1) Observed yield pressure (P_y) shall be greater than or equal to $1/F$ times the test pressure (P_h); for example, $P_y \geq 1/F \times P_h$ with an absolute minimum 1.18 × test pressure P_h ; and
2) Actual burst pressure (P_b) shall be greater than or equal to 1.22 / (R_{eg} / R_{mg}) times the test pressure (P_h) i.e. $P_b \geq (1.22 \times P_h) / (R_{eg} / R_{mg})$.’

(*Page* 11*, clause* **9.2.5**, *title*) — Substitute following for the existing:

‘*Base Check* (*for Cylinder Made from Tube or Made from Continuously Cast Billets*)’

(*Page* 12*, clause* **10.1.3**) — Insert the following new clause:

‘**10.1.4** For cylinders made from continuously cast billet material, base check shall be in accordance with **9.2.5**.’

(*Page* 15*, clause* **11.1**) — Substitute ‘Following final heat treatment, all cylinders except those selected for testing under **10**, shall be subjected to the following tests:’ *for* ‘Following heat treatment, all cylinders except those selected for testing under **10**, shall be subjected to the following tests:'

(*Page* 15*, clause* **11.4**, *last sentence*) — Substitute the following for existing: 'This test shall be conducted at a pressure not less than 2/3 × test pressure (P_h).'

(*Page* 16*, clause* **13**) — Substitute the following for existing:

'13 COLOUR IDENTIFICATION

13.1 The cylinder shall be painted or powder coated externally in accordance with the colour scheme specified in IS 3933 or IS 4379 or as approved by statutory authority.

13.2 For powder coating, use the coating system with final coat of powder and final coating shall have minimum thickness of 70 micron.

13.3 The cylinder shall be painted externally in accordance with the colour scheme specified in IS 3933 or IS 4379. Cylinders used as fire extinguisher or used in fire fighting service in accordance to IS 15683 or IS 2878 or it is used in fire fighting installation, shall be painted or powder coated externally to the requirement of respective standard or as agreed to between the purchaser and the manufacturer.'

(*Page* 16*, clause* **14.1**) — Substitute 'Each cylinder shall be permanently stamped with the following before final painting:' *for* 'Each cylinder shall be permanently stamped with the following:'.

[*Page* 16*, clause* **14.1** m)] — Insert the following new entry:

'n) If the cylinder (shell) is manufactured for dissolved acetylene cylinder according to IS 7312, each cylinder shall be permanently stamped with the following:

1) Serial number, identification of porous mass filler;
2) IS Number of this standard;
3) Inspector's official mark;
4) Maximum gas capacity;
5) Gas identification 'ACETYLENE' and the chemical symbol 'C_2H_2'; and
6) Additional marking as per IS 7312'.

(MED 16)

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